DOCUMENT RESUME

ED 313 098 PS 017 953

AUTHOR Butler, Joan M.; Handley, Herbert M.
TITLE Differences in Achievement for First Grade Students Taught in Small Classes.
PUB DATE Mar 89
NOTE 14p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, CA, March 27-31, 1989). For related document, see PS 018 430.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; *Class Size; Comparative Analysis; *Elementary School Students; Grade 1; *Listening Skills; *Mathematics Skills; Primary Education; Racial Differences; *Reading Skills; Sex Differences; Socioeconomic Status

ABSTRACT

In this study relationships between class size and 688 first grade students' academic achievement in reading, listening, and mathematics were examined in the 1986-87 and 1987-88 school years. Achievement test scores of 338 children in classes of 20 children each in 1987-88 were compared with test data of 350 first grade children in classes of 27 students each during the 1986-87 school year. The Stanford Achievement Test Battery, Primary 1, was administered in April in the course of the routine testing program for each of the two years. Test data reported by the test's publishers were employed as criterion variables in the study. Variables of gender, race, and class size were recorded from official class records. Eligibility for federal free lunch programs was the criterion used to evaluate socioeconomic status. Multivariate analysis of variance and analysis of variance statistics were used to analyze achievement differences. Results indicated that, compared to students taught in the larger group, the first graders taught in groups of 20 attained significantly higher total and subscale scores in word study skills, word reading, reading comprehension, vocabulary, listening comprehensi , spelling, concept of numbers, mathematics applications, environment, and reading. No differences in achievement were associated with gender, race, or socioeconomic status in any of the areas tested. (RH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED313098

Differences in Achievement for First Grade Students Taught in Small Classes

by

Joan M. Butler
Starkville (MS) Public Schools

Herbert M. Handley
Mississippi State University

Presented at the Annual Meeting of the
American Educational Research Association
San Francisco, CA

March 1989

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Joan M. Butler

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

PS 018053

BEST COPY AVAILABLE

For several decades educators have been debating the benefits of small class size. According to Robinson and Wittebols (1986), numerous studies have been conducted which examined the effects of class size on student achievement. The findings, however, of a considerable number of these investigations have indicated the relationship of class size and pupil achievement to be inconclusive (Porwell, 1978; Robinson & Wittebols, 1986).

Glass and Smith (1980) synthesized previous relevant research in the area of class size by the technique of meta-analysis and asserted that reduction of class size had a major impact on affective and cognitive development. Generalizations proclaimed by the researchers were questioned by Educational Research Service (1980) whose writers felt the conclusions drawn from the technique were too broad to justify adequately these findings.

Recently, as reported by Gilman (1985), the State of Indiana did a three year study which examined the results of reduced class size in the primary grades. The study investigated the relationship between class size and student achievement, while analyzing student attitudes toward self and school. Data indicated a significant increase in student achievement in the areas of reading and mathematics. Additional data were collected from principals, teachers and parents. These data substantiated that teachers were able to spend more time with individual students and were available to provide immediate feedback to them thus allowing students to progress at their own rate. Also, small class sizes enabled students to stay on-task at a higher percentage of the time when compared to students in larger classes (Chase, Mueller and Walden, 1986).

Bourke (1986) found a clear relationship between class size and math achievement. Specific teaching practices, as they relate to class size, were identified and analyzed. It was found that teachers with smaller classes spent

BEST COPY AVAILABLE

more time in questioning their students and gave them longer to respond which resulted in higher student achievement. Consequently, larger classes required more management time which detracted from the instructional time for the students. It was also found that more homework was assigned to students in smaller classes. According to Klein (1985), teacher satisfaction and student attitudes toward school improved when students were assigned to smaller classes. An earlier research investigation by Glass (1980) studied the affective outcomes of class size and found that teacher morale and student interest were greatly affected by the number of students assigned to a class.

Educational Research Service's (1978, 1986) reviews of current studies on class size reported the benefits of small class size are most evident in the primary grades and are especially beneficial to low achieving socially or economically deprived minority students. They also concluded that students would only benefit from reduced class size when the teacher adjusted the teaching technique to better address the individual needs of the students and utilized a greater variety of instructional materials.

Mueller, Chase and Walden (1988) cited costs as a major hurdle in reducing class size even though they recommended reducing class size especially in the primary grades for lower achieving and at-risk students. The Hatch School in Oak Park, Illinois, addressed the cost issue by rescheduling and rearranging staff to allow core subjects to be assigned 15 students per class. The rescheduling provided a three hour block of uninterrupted time to teach the core subjects of reading and mathematics and then merge the groups to form classes of 30 for the remaining subjects (Hawkinson, 1984).

Whittington, Bain and Achilles (1985) examined class size by reducing each first grade classroom to 15 students, with classes made up of more than 50

percent of the students determined to be economically disadvantaged. The results indicated that reducing class size from 25:1 to 15:1 had a positive effect on improving the achievement of disadvantaged students. Similarly, the National Education Association (1986) endorsed the optimal class size of 15 students in elementary classes as a way to provide more individualization and to better diagnose the student's learning needs, thus resulting in improved student achievement. The general public is supportive of reducing class size as seen the Gallup Poll for 1988. This report indicated that 71 percent of the public surveyed perceived the reduction of class size from 35 to 20 students to greatly improve achievement.

The Research Problem

The problem in the study was to determine if there were achievement differences in mean test scores for first grade children associated with the reduction of class size from 27 to 20 students. It was hypothesized that such reduction of class size would raise students' achievement scores on a standardized test significantly. It was further hypothesized that differences in race, sex and socioeconomic status traditionally found among achievement scores of first grade children would be eliminated since teachers would now have more time for individualizing instruction.

The Research Plan

The study was planned as an ex post facto investigation with independent variables of differences in class size, race, sex and socioeconomic status of students. Major dependent variables were achievement scores in the areas of total reading, total listening and total mathematics. Other dependent variables studied were achievement in the subtest areas of word study skills, reading comprehension, vocabulary, word reading, listening comprehension,

spelling, concepts of numbers, math concepts and applications, environment and reading.

Subjects of Study

Subjects involved in the study were 688 first grade students. They were enrolled in the first grade during the 1986-87 and 1987-88 school years. The achievement scores of the first grade pupils enrolled in the school district for 1987-1988 were compared to the achievement scores of the previous year's first graders.

Complete test data were collected for 338 first graders taught by 17 teachers each having 20 students and an assistant teacher in their classes. Data were also collected for 350 first graders of 1986-87 from their files. These students were assigned to classes of 27 students with a teacher and an assistant teacher.

Methods of Study

The Stanford Achievement Test battery, Primary 1, was administered to the first graders in April in the routine testing program for each of the respective years. Test data reported by the test's publishers were employed as criterion variables in the study. Variables of gender, race and class size were recorded from official class records. Eligibility for free lunch programs provided by the federal government was the criteria used to evaluate socio-economic status. Data for this variable were recorded as eligible or ineligible for free lunch as established by accepted criteria.

Multivariate analysis of variance (MANOVA) and analysis of variance statistics were used to analyze differences in achievement (Nie, Hull, Jenkins, Steinbrenner, and Bert, 1975).

Results

Results of the MANOVA showed that first graders taught in groups having fewer than 20 children achieved significantly higher in the composite areas of total reading, total mathematics and total listening than did their counterparts in classes of 27 students the previous year. These data are shown in Table 1. In further analysis, it was also discovered that the children in the smaller groups also achieved significantly higher in each of the respective three areas studied than did those in the larger group. A second analysis was also conducted to compare the achievement of the two groups in nine achievement subcategories. As indicated on Table 2, this analysis also showed a significant difference at the .01 level in all nine achievement areas.

No differences in achievement were found to be associated with the variables of gender, race and socioeconomic status in the areas of reading, mathematics or listening. These data are shown in Table 3.

Discussion

Within the constrictions of this quasi-experimental design, these data definitely supported the hypothesis of achievement being enhanced by reducing the class size of first graders to 20 in the group. The data also showed that no differences in achievement associated with gender, race and socioeconomic status were indicated for these independent variables and for their interaction with the main effect of class size.

A new finding in this school district was that no differences in race, sex and free lunch eligibility were found relative to achievement. Traditionally,

differences in achievement have been found to be associated with these three variables. The new instructional program with smaller class sizes apparently offers opportunity for them to better meet the individual needs of students.

The smaller standard deviations found in all achievement scores for the first graders with free lunches were also not expected. Apparently the variation for learning for students in these areas is not so great as that found in larger classes. Two points need to be made. One, the students are all learning about the same in the smaller classes; i.e., the range of learning is smaller. Two, the ceiling for learning may have been lowered to a level that all children can comprehend. If this second conjecture is occurring, then, the students working at the upper levels of achievement are being penalized. Regardless of the causal factor, these standard deviations are very low. They are about one-third the size expected in a random population.

One difference in the study that could not be controlled was that first graders in the control group were taught in homogeneously grouped classes, whereas those in the smaller groups this past year were grouped heterogeneously or randomly. This difference, however, should not make an impact on the effect of this study Butler, Wollenberg, and Handley (1987) found no difference in the achievement of children relative to homogeneous and heterogeneous ability grouping.

This study is currently being replicated in order to verify the achievement gains associated with having smaller classes at the first grade level. Also being examined are the achievement scores of the second graders who will be in the second year of learning in a smaller class size environment. Current data, however, appear to justify recommendations to reduce class size in first grade in order to enhance achievement. Although reducing class size

is quite expensive, the gains that are observed in student achievement are well worth the cost as demonstrated by this research.

Table

Comparing Achievement for Students Taught in Small Classes and Large Classes in Reading, Listening and Mathematics

	Small Class			Larger Class				
Achievement Area	N	$\bar{X}$	SD	N	$\bar{X}$	SD	df	F
Total Reading	338	524.5	67.1	350	472.3	175.9	1,687	26.04**
Total Listening	338	561.2	64.9	350	506.7	185.4	1,687	26.18**
Total Mathematics	338	529.1	88.9	350	478.4	176.9	1,687	22.34**
Overall	338			350			3,684	9.03**

**$p < .01$

Table 7

Comparing Achievement in Subscale Areas for First Graders Taught in Small and Large Classes

Achievement Area	Small Classes			Large Classes			df	F
	N	$\bar{X}$	SD	N	$\bar{X}$	SD		
Word Study Skills	338	525.7	65.4	350	474.9	176.3	1,687	24.84**
Word Reading	338	524.7	59.9	350	467.6	173.2	1,687	33.11**
Reading Comprehension	338	523.1	66.8	350	472.1	176.9	1,687	24.40**
Vocabulary	338	555.9	66.8	350	503.0	184.7	1,687	24.63**
Listening Comprehension	338	567.3	66.6	350	511.3	187.6	1,687	26.87**
Spelling	338	503.7	77.9	350	444.7	171.2	1,687	33.40**
Concept of Numbers	338	532.4	82.0	350	474.5	178.5	1,687	30.08**
Math Applications	338	532.4	89.2	350	483.8	179.0	1,687	20.08**
Environment	338	551.6	61.4	350	494.4	186.0	1,687	28.91**
Reading	338	523.5	62.7	350	469.7	175.4	1,687	27.74**
Total Set	338			350			10,677	5.46**

**$p < .01$

Table 3

Relationship of Race, Sex, and Free Lunch Eligibility to Achievement of First Graders

Achievement Area	F Ratios		
	Race	Sex	Free Lunch
Word Study Skills	.95	.33	1.62
Word Reading	.61	.16	1.40
Reading Comprehension	1.35	.95	2.74
Vocabulary	.39	.04	.85
Listening Comprehension	.34	.01	.46
Spelling	.12	2.52	2.11
Concepts of Numbers	1.74	.13	.94
Math Computations/ Applications	1.18	.08	.90
Environment	.14	.19	.33
Total Reading	.94	.60	3.03
Total Listening	.39	.01	.62
Total Mathematics	1.45	.05	.93

$F \geq 3.83$ needed for significance at .05 level

References

Bourke, Sid. (1986). How smaller is better: Some relationships between class size, teaching practices, and student achievement. American Educational Research Journal, 23 (4), 558-571.

Butler, J. M., Wollenberg, J. P. & Handley, H. M. (1987). Similarities in achievement, time-on-task and self-concept of homogeneously and heterogeneously grouped second and third graders. Presented at the 1987 annual meeting of the Mid-South Educational Research Association.

Chose, C. I., Mueller, D. J. & Walden, J. D. (1986). Prime time: Its impact on instruction and achievement. Indianapolis, Ind.: Indiana Department of Education.

Education Research Service. (1980). Class size research: A critique of recent meta-analyses. Phi Delta Kappan, 62(4), 239-241.

Futrell, M. (1986). Elementary schools and keys to learning: NEA urges smaller class size as first step. Washington, D.C. NEA News.

Gallup, A. M. & Elam, S. M. (1988). The 20th annual Gallup Poll of the public's attitudes toward the public schools. Phi Delta Kappan, 70(1), 33-46.

Gilman, D. A. (1985). The educational effects of project prime time. Unpublished study. North Gibson, Indiana.

Glass, G. V. (1980). On criticism of our class size/student achievement research: No points conceded. Phi Delta Kappan, 62(4), 242-244.

Glass, G. V. & Smith, M. L. (1980). Meta-analysis of research on the relationship of class size and achievement. American Educational Research Journal, 17(4), 419-33.

Hawkinson, H. (1984). Hatch School-Not at Risk. Phi Delta Kappan, 64(11), 181-82.

Klein, K. (1985). The research on class size. Phi Delta Kappan, 66(8), 578-80.

Mueller, D. J., Chase, C. I. & Walden, J. D. (1988). Effect of reduced class size in primary classes. Educational Leadership, 45(5), 48-50.

Nie, N. H., Hull, C. H., Jenkins, J. G., Steinbrenner, K., & Bert, D. M. (1975). SPSS. Statistical package for social sciences. New York: McGraw Hill.

Porwell, P. J. (1978). Educational Research Service. Class size: A summary of research. Arlington, Va.: ERS Publishers.

Robinson, G. E. & Wittebols, J. H. (1986). Class size research: A related cluster analysis for decision making. Arlington, Va.: ERS Research Brief.

Whittington, E. H., Bain, H. P, & Achilles, C. M. (1985). Effects of class size on first grade students. ERS Spectrum, 3(4), 33-39.